R E P O R T R E S U M E S

ED 012 947 CG 000 670

SOME EFFECTS OF A REFINED GRADING SCALE.

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REPORT NUMBER BR-5-8243 PUB DATE 66
REPORT NUMBER CRP-S-286
EDRS PRICE MF-$0.25 HC-$2.08 52P.

DESCRIPTORS- *COLLEGE STUDENTS, *GRADING, *RESEARCH, *GRADE PREDICTION, QUESTIONNAIRES, GRADES (SCHOLASTIC), *ACADEMIC ACHIEVEMENT, ACHIEVEMENT RATING, CORRELATIONS

THIS STUDY DETERMINED THE EFFECTS OF A REFINED FRACTIONAL GRADING SCALE UPON STUDENT ACHIEVEMENT AND COMPARED THE REFINED SCALE WITH THE TRADITIONAL SCALE AS THESE COMPARISONS REFLECTED PREDICTIVE VALUE, HONOR ROLL STATUS, FACULTY AND STUDENT RECEPTIVITY TO THE REFINED SCALE, AND THE SELECTION OF PROBATIONARY STUDENTS. THE STUDY SAMPLE WAS 2,200 STUDENTS IN 32 DEPARTMENTS AT CENTRAL WASHINGTON STATE COLLEGE. ORIENTATION SESSIONS PROVIDED INSTRUCTIONS FOR REPORTING GRADES TO 183 INSTRUCTORS. THE FRACTIONAL SCALE CONSISTED OF 45 INTERVALS FROM .0 TO 4.5. BOTH FRACTIONAL AND TRADITIONAL GRADES WERE GIVEN. STUDENT REACTION TO THE SCALE WAS ASSESSED BY AN OPINIONNAIRE. WHEN THE FRACTIONAL SCALE WAS USED, (1) HIGHER CORRELATIONS BETWEEN PREDICTED GRADES AND ACHIEVED GRADES WERE OBTAINED FOR STUDENTS IN 20 DEPARTMENTS WHILE LOWER CORRELATIONS WERE OBTAINED FOR STUDENTS IN FOUR DEPARTMENTS, (2) DIFFERENT STUDENTS WERE SELECTED FOR HONORS AND PROBATION, (3) STUDENTS SELECTED FOR PROBATION TENDED TO HAVE HIGHER HIGH SCHOOL GRADES, AND (4) A MORE DISCREET REPORT OF STUDENT ACHIEVEMENT WAS POSSIBLE. STUDENTS FAVORED THE FRACTIONAL SCALE AND FELT IT REVEALED TRUE PERFORMANCE MORE ACCURATELY. (SK)

ED012947

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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SOME EFFECTS OF A REFINED GRADING SCALE

Cooperative Research Project No. S-286

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1965-1966

The research reported herein was supported by the Cooperative Research Program of the Office of Education, U. S. Department of Health, Education, and Welfare.

CG 000 670

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PROBLEM

This study focused upon the problem of refining the A, B, C, D, E reporting scale used as the criterion variable for academic success in college. The traditional scale, which reports academic achievement in rough areas of superior, excellent, average, fair, and failing, has long been recognized as a crude report, yet few studies have attempted to refine this report and determine the effects of this refinement. This study attempted to determine the effects of a refined scale upon student achievement and to compare the refined scale with the traditional scale as these comparisons reflected predictive value, honor roll status, faculty and student receptivity to the refined scale, and the selectivity of probationary students.

OBJECTIVES

The major objective was to explore the effects of reporting academic achievement on a more refined scale than the typical A, B, C, D, and E. The specific objectives were:

1. To compare grade predictions using the traditional and the new scale as criteria.
2. To determine the effect of a fractional scale upon the number and identity of probationary students, students remaining in good academic standing, and honor students.
3. To assess the attitude of students toward the adoption of the fractional scale.
4. To assess the attitude of the teaching staff toward the use of the fractional scale.

HYPOTHESES:

1. A refined reporting scale will have a higher correlation with predicted grades than will the old reporting scale.
2. Different students will be selected for the Honors program and probationary status when the new scale is applied.
3. The average grade point will not be significantly changed when the new reporting scale is used.

RELATED RESEARCH

The use of a report to describe academic achievement has been an integral part of America's higher education since the 17th and 18th century. The accuracy by which the report describes achievements has been questioned for just as long. The use of high school grades, achievement tests, and various other measures to obtain an estimate of the student's academic potential also has a long history.

Ideally, the students who enter college with the highest academic marks from high school or another institution and make the highest achievement scores should perform best on the college level. Studies generally prove this to be true but they also show the academic mark to be most unreliable. Even though the inaccuracies of these marks are well known, institutions of higher learning do not hesitate to require specific grade point averages to remain in good standing or to achieve graduation. One of the recognized problems through the years has been to develop a reporting process or scale which more explicitly describes academic accomplishment.

Studies dealing directly with the accuracy of the traditional five-point grading system have been numerous. Meyer, shortly after the turn of the century, initiated one of the major studies which dealt with the reliability of the A,B, C,D,E scale or the teacher's mark. Johnson, in 1911, and Starch

and Elliott in 1912, made a significant contribution to this body of research when they showed how inaccurate the academic mark had become. They found that the teacher's mark of student academic success was poorly related to other measures of achievement. Such things as student attitude, effort, discipline, and sundry variables inevitably contaminated the report of achievement. This has contributed in undefinable ways to the unreliability of teachers' marks. Ashbaugh, in 1921, corroborated these studies.

The earliest studies by August Dvorak in the 30's at the University of Washington, showed clearly that when high school marks were used for the admission of students to the University that they had little predictive value for the students selected. The Melvin Angell, Maurice Pettit, et al, studies in the late 40's showed that not only did low correlations exist between high school and college marks, but that some subject areas such as high school English had negative correlations with college subjects. They also found that there was little justification for the existance of an admission policy at the University of Washington based upon high school grades, especially if their admission standards were to be interpreted as predictors of University achievement.

The American Council on Education in their publication, "Predicting Success in Professional Schools" (1949) reported that the correlation between high school English, natural sciences, social sciences and mathematics had correlations of only .35, .46, .33 and .49 respectively, with first year Engineering courses.

Cook and Martinson (1962) contributed the low correlations between high school and college marks to the lack of quality of the individual mark. They found that the increased number of courses in a given subject area does not increase its predictive value and that it is the quality of the mark which is essential. They also found in their study that no set pattern of courses is particularly "crucial" for college success and insisted again that the

quality of the report is the essential ingredient in order to improve the relationship.

Jex and Merrill, (1945) when studying the persistence of college students as it is related to withdrawl and graduation rates at the University of Utah, found that the higher grade point students from high school tend to have better chances of college success. Every study in this field has supported this finding. Jex and Merrill found also that only 3.4 per cent of the students receiving A grades or better from high school failed to pass the Freshman year's work, while 84.2 per cent failed if they were D students in high school, 74.1 per cent if D+ students, 65.8 per cent if C students, 37.2 per cent if C+ students and 21 per cent if they were B students.

Endler and Steinberg (1963) conclude that the only consistent findings in studies attempting to predict academic success is that there are no consistent results. They, along with others, found that the best predictor of freshman grade averages was high school grades, but these never exceeded a correlation of .49 for male students. A correlation of .84 resulted, however, when only female members of the class composed the sample.

Lavin's Theoretical Analysis and Review of Research on the Prediction of Academic Performance (1965) reports that no system of independent variables seems to elevate the correlation. He attributes this, in part, to the difficulties of judging academic performance. He points out that not all students take the same courses, teachers use different criteria in assigning grades, and grades are an interaction between student and teacher. In his analysis, Lavin made no reference to the unrefinement of the academic reporting scale. He did suggest that the assumption of linearity in prediction is not always accurate and that a curvilinear relationship may actually exist.

The attempts to refine the criterion variable are few in number. The University of Nebraska used for a few years, but since discontinued, a stanine scale to report grades. The quality of the stanine was also used to

determine the number of credits a given student would receive. The process was reportedly discontinued because of the difficulty of designating the amount of credit which the student received.

August Dvorak and Paul Horst were the prime movers in 1956 when they initiated an all-out effort on the problem of improving the prediction of college success. Their efforts resulted in the State of Washington adopting in 1957 a state-wide Differential Grade Prediction program which is accomplished for all students entering any institution of higher learning. The independent variables from which these predictions are made have been reordered in many different ways. Primarily, they include high school grade point averages in each academic subject, total high school grade point average, an intelligence score, academic achievement test scores using a variety of standardized tests, aptitude test scores, age, sex, vocational interest test scores, and academic rank in class. The predictions are made on a fractional scale for each academic subject as well as for the overall college average. The academic marks which constitute a number of the independent variables used to make these predictions are all derived from the traditional scale of 4, 3, 2, 1 or A,B, C,D, and E. Their conclusion, after having experimented for seven years with a great variety and combinations of predictor variables, is that no array or combination of independent variables will improve the accuracy of the college predictions until the report or grade for student achievement is refined. Because of the plateau and the conclusion reached by the researchers in this area, the present study was initiated.

This study is unique in that it has been the only one to involve an entire teaching faculty in the utilization of a refined grade for each student in every course. It is also unique in that it had a differential grade prediction for each student in every subject area with which to compare the criterion variable.

PROCEDURES

The population for this study consisted of all students registered at Central Washington State College for the Fall, Winter and Spring quarters for the 1964-65 academic year. A letter grade and a new fractional scale grade were reported for every student in every course for this period. This involved something over 3700 students and 220 faculty members. Beginning in the Fall quarter of 1964, all instructors at Central Washington State College attended the orientation meetings which were held to explain the new method of reporting grades. Examples of how the new scale would apply were given and an especially prepared instructional sheet was distributed for their information and use. This appears in Appendix A. It should be pointed out that not only did the instructors receive assistance in how to translate the letter grades into the fractional scale, but more importantly they were cautioned to not modify or change their present procedure for evaluating their students. After the students enrolled had been identified, their names were compared with the grade prediction data sheets to determine which students had the data essential for the study. This meant that all students who did not have a differential grade prediction program were excluded. The study sample turned out to be 2200 students. These students were in thirty-two departments and were instructed by 183 instructors. The reason that the number of departments are in excess of the number of departments described in the catalog is that Central's department of foreign language, for example, offers several foreign languages. Grade predictions exist for each individual language; that is, there is a separate grade prediction for Spanish, another for French, another for German, etc. These in the report are considered to be separate departments. The logic for this is that a person may do well in a Germanic language, but not so well in a Romanic language. For this reason separate predictions are accomplished. A separate IBM card for each student in each course was punched. Each card contained the name of the student, his code

number, the name of the instructor, the course enrolled in, the number of course credits, the predicted grade for that course, the predicted grade for his all college work, the achieved grade for that course on the old scale, the achieved grade for that course on the new scale, and products of the grade points and the course credit on both scales. During the summer of 1965, the final decks were prepared and the program written for the operational decks. The program was then prepared and the data run at the University of Washington's new computer center.

During the Winter quarter of 1966, the students' reactions to the possible application of the new scale were obtained by using class time to complete the opinionnaire. The instrument used to secure this data is shown in Appendix B. This was done by using an opinionnaire with the Junior and Senior students in twelve different departments. The number sampled totaled 312. During the spring quarter of 1966, the faculty's reaction to the possible adoption of the new scale was also obtained. This was accomplished in one of the faculty meetings which afforded an opportunity for all faculty to vote. The results of the study were also presented to the Faculty Senate and the Dean's Council. They, in turn, gave their reactions and recommendations.

ANALYSIS OF DATA AND FINDINGS

A. Effects on General College

The correlations between the predicted all college average and the achieved all college average were .48 and .49 for the old scale and the new scale respectively. The correlation between Autumn quarter grades and the total academic year grades was .83 for the old scale, and .85 for the new scale. The correlation between the Autumn quarter grades and the academic year grades for the Honor students on the old scale was .57 and for the new scale was .65. The correlation between the Autumn quarter grades and the academic year grades on the old scale for the average group was .63 and for the new scale was .66. When the same correlations were computed for the probationary students, the old scale showed a correlation of .49 and the new scale showed a correlation of .56.

B. Comparison of Correlations Between Predicted Grades and Achieved Grades on the Old Scale and the New Scale by Departments.

Twenty-eight departments showed higher correlations with the new scale while only four departments showed a lower correlation. This condition proved to be significant beyond the .01 level. The range was:

	OLD SCALE	NEW SCALE
HIGH	.5522	.5888
LOW	.1726	.2032

Table I shows the correlations between predicted and achieved grades by departments on the old and new scale.

C. Comparison of Means

The average grade point for the entire sample on the old scale was 2.44. The average grade point on the new scale was 2.45. The average grade point for Honor students on the old scale was 3.28 and on the new scale, 3.29. The average grade point for the middle or average group of students was 2.46 on the old scale and 2.47 on the new scale. The average grade point for the academic casualties or probationary students was 1.62 for the old scale and 1.64 for the new scale.

D. Comparison of the Variance Between Predicted and Achieved Grades on the Old and New Scale.

Consistent with the higher correlations for the new scale by departments, the variance between the predicted and achieved grade paralleled this consistency. The average variance between the predicted and achieved grade for the old scale was .84 and for the new scale it was .78. Such variance refers to .84 of a grade on the old scale and .78 of a grade on the new scale. The smaller variance for the new scale indicates that the fractional system allows for a report of achievement which approximates more closely the predicted grade.

E. Comparison of Correlations Between the Predicted and Achieved Grade on the Old and New Scales by Instructors.

The correlations between the predicted and achieved grade on the old and new scale by instructors was .40 on the old scale and .42 on the new scale. Of the 183 instructors, only 159 had sufficiently correct data to analyze. Of these 159 instructors, 118 had higher correlations with the new scale while thirty-four had higher correlations with the old scale. (Seven instructors had identical correlations on both scales). Some correlations were finally omitted from the final count because of the small number of students in the classes. The Chi-square test showed significance at the .01 level. The range of correlations was:

	OLD SCALE	NEW SCALE
HIGH	.6582	.7367
LOW	-.3505	-.1706

In some cases the correlations of the new scale were .10 higher than the old scale. One department had seven instructors with negative correlations on both scales. The study did not furnish data which might explain this phenomenon. The complete list of correlations by instructors is contained in Table II.

F. Effects of New Scale on Students

The total number of students selected for the Honor Roll on the old scale was 354 and on the new scale, 355. The old scale placed 1267 in the average group, while the new scale placed 1240 in this category. 579 students were placed on probation by the old scale, while the new scale placed 605 on probation. As was anticipated, different students composed each of these three groups. There were thirty-seven students placed in the average group by the old scale but were placed in the Honors group by the new scale. However, there were thirty-six students placed in the Honors group who were dropped to the average group by the old scale. Table III shows the correlations between the predicted and achieved grades for Honor

students by departments. The average group had sixty-one students reduced to probationary status by the new scale. At the same time the probationary group had thirty-five students placed in the average group by the new scale. Analysis of the students' predicted grades, high school grade point average, and the course credits taken show that the new scale places students in Good Standing which the old scale placed on probation. When inspecting the predicted grade and the high school grade point average of these students the following resulted:

Old Scale = Average New Scale = Probationary

Number	Old Scale GPA	New Scale GPA	Predicted GPA	High School GPA	Course credits earned for year
61	2.04	1.93	1.77	2.34	31.8

Old Scale = Probationary New Scale = Average

Number	Old Scale GPA	New Scale GPA	Predicted GPA	High School GPA	Course credits earned for year
35	1.93	2.05	2.00	2.58	36.7

It is obvious that the new scale selected students to remain in college who have the highest grade point prediction and the highest high school grade point average and who take more course credits per year. This, in part, explains the consistently higher correlations with the new scale. The same comparisons made for the Honors group are as follows:

Old Scale = Honors New Scale = Average

Number	Old Scale GPA	New Scale GPA	Predicted GPA	High School GPA	Course credits earned for year
36	3.05	2.93	2.26	2.83	38.7

When analyzing the middle or average group, the following resulted:

Old Scale = Average New Scale = Honors

Number	Old Scale GPA	New Scale GPA	Predicted GPA	High School GPA	Course credits earned for year
37	2.90	3.06	2.26	2.78	41

G. Student Reactions

As part of the study an opinion poll of the upper classmen in seven departments was made. These students were given an opinionnaire which contained a statement of the purpose of the study, an explanation of the new scale, typical pro and con arguments about the new scale, and their reactions were requested as to how the new scale might affect their study habits. The pro and con statements were developed by a committee of selected faculty members who had previously expressed positive and negative reactions to the new scale's application. 321 students responded to the opinionnaire. This was accomplished by an arrangement with the instructors of selected classes. The instrument used is contained in Appendix B. Without verbal elaboration the students were asked to read carefully the instructions and to furnish their responses. These were students whose grades had been submitted the previous year on both scales. The results of the opinionnaire showed that 278 students favored the adoption of the new scale while forty-three opposed its adoption. The students also responded to the three-part question as to the effect the new scale would have on their study habits. The results showed the following:

	For Adoption	Against Adoption
Encourage better study habits	125	2
No change in present habits	121	32
Discourage present efforts	2	5
No opinion	30	4
	278	43

Here it becomes evident that in the student's opinion the adoption of the new scale would have no negative effect upon their study habits and over forty per cent of the sample felt that the new scale would encourage better study habits. In the space for comments, the students explained

that their study habits would be improved because they would have the opportunity to move up the scale and improve their position by doing well on the mid-term and/or the final and it could be reflected by the new scale. Some students said they could not improve their grade from a C to a B on the old scale but they might improve their position on the new scale because any change as a result of their study would be noted. They expressed their disappointment with the old scale which never reflected their exact performance and felt that they had on many occasions only missed a higher grade by the smallest of margins. They felt the new scale would reveal their true performance more accurately.

H. Faculty Senate Reactions to the Fractionated Scale

When the Faculty Senate was presented the results of the study, discussion which occupied the better portion of three Faculty meetings ensued. At the conclusion of the third meeting a vote of the Faculty Senate was taken recommending to the faculty the adoption of the new scale. The result of this vote was eighteen in favor, four opposed, and three abstaining.

When the Faculty Senate presented their recommendation to the entire faculty to check their reaction to the adoption of the new scale, a lively discussion took place. Many comments from the faculty expressing their fears that the new scale would change the probation and graduation requirements resulted. Some also expressed the difficulty they would have with the arithmetic involved in computing their grades to a fractional scale. They said they could not discriminate as discreetly as the new scale indicated to them that they should. After a full hour's discussion, a vote was taken of the Faculty. 114 voted against the adoption of the new scale. Seventy-eight voted in favor of the new scale and approximately one-third of the faculty did not excercise their right to vote. It must be pointed out that the faculty who reacted to the new scale included over fifty new faculty members who had not used the new scale or had any previous information about it. This was not under the researchers' control as the Faculty

Senate wanted all faculty to respond. They reasoned that because all would use it, all should vote. Final disposition of the issue by the administration has not been made at this time.

CONCLUSIONS AND IMPLICATIONS

1. The new scale appears to be only slightly better than the old scale as a reporting scale for all college averages as the correlation was only slightly higher for the new scale. The higher but relatively low correlation for the new scale is disappointing in light of the correlation of .634 obtained in the first Pettit and Crawford study. In light of the number of recording errors found when translating the data from the grade sheets to the IBM cards, this is perhaps understandable. Individual faculty members, while in the faculty meeting and when talking individually to the investigators, expressed their annoyance at having to do both scales each quarter. They said they did not give it the attention it deserved and some were quite apologetic about it. This condition would definitely affect the results.
2. The relatively high correlation of .85 produced by the new scale between Autumn quarter grades and the full academic years' work has definite counseling contributions. Some adjustments in the student's course work can be made if specific data related to his academic goals are available. The same conclusion can be made from the old scale which produced a correlation of .83. The correlations between Autumn quarter grades and the full academic year's work were considerably higher with the new scale for the Honors group. The old scale in this comparison produced a .57 correlation, while the new scale produced a correlation of .65.

3. The new scale showed a consistently higher correlation than the old scale when department grades were computed. One can conclude that the new scale is a superior scale for the departments to use and the consistently higher correlations were significant beyond the .01 level.
4. The new scale appears to be an improvement for the instructors. Seventy-four per cent of the instructors showed higher correlations between predicted and achieved grades when they applied the new scale. This was accomplished in spite of some rather half-hearted efforts on their part to accurately apply it.
5. The new scale appears to be superior to the old scale as it produces higher correlations between predicted and achieved grades for all students whether they be Honor, Average, or Probationary. This is highly significant for the college which selects its students on the criteria that composes the independent variables for the predictions. This superiority is especially important when the probationary list is carefully inspected. Students with higher high school marks, higher predicted grades, and students who carry heavier academic loads are retained by the new scale.
6. The variable of the means of the predicted grades is significantly smaller for the new scale which indicates that a more discreet report of student achievement is possible with a refined scale.
7. Students prefer a scale which can differentiate academic performance. Their apparent need and desire to be individuals is more expertly served by a scale which allows more discreet reports of academic performance. The condition which allows them to receive exactly what they earned is one they are quite willing to accept.

8. The academic Senate, which had much more time to deliberate about the results of the study and the merit of the new scale, was highly favorable to its adoption. One can only conclude that change is a condition requiring much convincing evidence, and a large faculty meeting is not an arrangement which affords much enlightenment and careful examination.
9. The faculty's perference to retain the old system was disappointing but understandable. Although the new scale produced much evidence of its superiority, it did not prove to be "pure gold" and the faculty was not like the medical profession which seems agreeable to using a disinfectant which is not harmful but promises to eliminate at least a few more bugs. College faculties are looking for the "sure" cures.

TABLE I

CORRELATIONS BETWEEN PREDICTED AND ACHIEVED GRADES
BY DEPARTMENTS ON OLD AND NEW SCALE

	OLD SCALE	NEW SCALE
Air Science	.55	.59
Anthropology	.17	.20
Art	.24	.27
Business Administration	.17	.23
Business Education	.27	.28
Biological Science	.44	.46
Botany	.33	.36
Chemistry	.38	.40
Economics	.33	.32
Education	.19	.20
English	.41	.43
French	.30	.32
Geography	.50	.52
Geology	.50	.49
Home Economics	.35	.36
History	.23	.24
Journalism	.35	.40
Library Science	.44	.45
Mathematics	.40	.40
Music	.22	.23
Philosophy	.22	.24
Physical Science	.31	.34
Physics	.31	.36
Political Science	.26	.27
Psychology	.43	.45
Radio & T.V.	.49	.53

TABLE I
(Cont'd)

	OLD SCALE	NEW SCALE
Science Education	.37	.36
Sociology	.42	.43
Social Science	.28	.30
Speech	.33	.37
Spanish	.39	.40
Zoology	.30	.33

TABLE II

CORRELATIONS BETWEEN PREDICTED AND ACHIEVED GRADES
BY INSTRUCTORS FOR OLD AND NEW SCALE

Instructor Number	Old Scale	New Scale	Instructor Number	Old Scale	New Scale
1.	.27	.32	25.	.46	.51
2.	.29	.34	26.	.42	.42
3.	.31	.34	27.	.46	.50
4.	.04	.03	28.	.48	.41
5.	.48	.46	29.	.57	.56
6.	.58	.58	30.	.25	.33
7.	.12	.18	31.	.36	.39
8.	.28	.30	32.	.35	.34
9.	.31	.26	33.	.13	.17
10.	.46	.48	34.	.31	.38
11.	.21	.22	35.	.29	.36
12.	.22	.15	36.	-.35	-.17
13.	.28	.26	37.	.38	.41
14.	.40	.44	38.	-.01	.07
15.	.42	.40	39.	.18	.19
16.	.32	.31	40.	.31	.39
17.	.14	.16	41.	.52	.54
18.	.39	.40	42.	.25	.26
19.	.39	.38	43.	-.12	-.12
20.	.19	.18	44.	.56	.58
21.	.44	.48	45.	.40	.41
22.	.29	.33	46.	.30	.30
23.	.17	.21	47.	.18	.28
24.	.50	.53	48.	.28	.36

TABLE II
(Cont'd)

Instructor Number	Old Scale	New Scale	Instructor Number	Old Scale	New Scale
49.	.26	.28	77.	.16	.15
50.	.21	.22	78.	.49	.50
51.	.33	.32	79.	.28	.30
52.	.22	.23	80.	.31	.39
53.	.38	.40	81.	.46	.49
54.	.16	.14	82.	.37	.40
55.	.07	.11	83.	.46	.49
56.	.12	.11	84.	.41	.48
57.	.62	.72	85.	.34	.43
58.	.43	.46	86.	.28	.25
59.	.36	.37	87.	.47	.50
60.	.44	.49	88.	.36	.37
61.	.12	.15	89.	.50	.52
62.	.49	.53	90.	.21	.16
63.	.43	.46	91.	.25	.27
64.	.22	.26	92.	.46	.46
65.	.13	.18	93.	.56	.60
66.	.33	.37	94.	.30	.25
67.	.47	.49	95.	.14	.20
68.	.28	.27	96.	.54	.56
69.	.09	.09	97.	.38	.43
70.	.65	.73	98.	.19	.23
71.	.41	.45	99.	.35	.39
72.	.58	.57	100.	.17	.22
73.	.43	.44	101.	.41	.44
74.	.23	.24	102.	.45	.46
75.	.22	.25	103.	.09	.13
76.	.25	.28	104.	.26	.27

TABLE II
(Cont'd)

Instructor Number	Old Scale	New Scale	Instructor Number	Old Scale	New Scale
105.	.28	.29	133.	.42	.50
106.	.31	.27	134.	.07	.001
107.	.30	.32	135.	.10	.09
108.	.51	.50	136.	.31	.26
109.	.006	-.02	137.	.16	.16
110.	.40	.46	138.	.09	.13
111.	.47	.46	139.	.21	.24
112.	.38	.40	140.	.36	.41
113.	.14	.18	141.	.44	.45
114.	.14	.15	142.	.34	.40
115.	.44	.46	143.	.26	.31
116.	.45	.46	144.	.30	.25
117.	.14	.17	145.	.27	.25
118.	.38	.36	146.	.50	.53
119.	.33	.34	147.	.41	.47
120.	.40	.63	148.	.64	.72
121.	.16	.17	149.	.18	.16
122.	.60	.67	150.	.48	.51
123.	.27	.30	151.	.41	.47
124.	.41	.43	152.	.32	.33
125.	.41	.51	153.	.27	.35
126.	.27	.32	154.	.25	.26
127.	.49	.52	155.	.29	.31
128.	.11	.15	156.	.22	.21
129.	.04	.07	157.	.25	.24
130.	.29	.34	158.	.31	.33
131.	.30	.32	159.	.31	.40
132.	.18	.21			

TABLE III

CORRELATIONS BETWEEN PREDICTED AND ACHIEVED GRADES
FOR HONOR STUDENTS BY DEPARTMENTS

	OLD SCALE	NEW SCALE
Air Science	.33	.59
Anthropology	.08	.20
Art	-.05	.26
Business Administration	.04	.23
Business Education	.18	.27
Biological Science	.33	.46
Botany	.02	.36
Chemistry	.33	.40
Economics	.22	.32
Education	.04	.06
English	.24	.26
French	.07	.17
Geography	.06	.06
Geology	.23	.20
Home Economics	.12	.09
History	.06	.09
Journalism	-.08	-.09
Library Science	.60	.65
Mathematics	.27	.25
Music	.04	.02
Philosophy	.02	.06
Physical Science	.16	.31
Physics	.57	.69
Political Science	.21	.15
Psychology	.18	.21
Radio & T.V.	.27	.33

TABLE III
(Cont'd)

	OLD SCALE	NEW SCALE
Science Education	.18	.18
Sociology	.12	.10
Social Science	.36	.35
Speech	.37	.44
Spanish	.33	.36
Zoology	.26	.33

APPENDIX A

TO : ALL FACULTY

FROM : J. Wesley Crum, Dean of Instruction

SUBJECT : Very Important Change in New Decimal Grading System

DATE : October 22, 1964

The Faculty Senate met on October 21 and gave official approval for experimenting with a decimal grading system throughout 1964-65. However, it changed the rules somewhat. Therefore, please destroy the materials distributed to you under date of September 29, 1964 and use the following material.

HOW TO LIVE WITH THE DECIMAL GRADING SYSTEM

The new grade scale is little more than an attempt to record the distinction between a high A and a low A, a medium C and a high C, etc. It should not influence your distribution of A's, B's, C's, and D's. And, E's are still E's. A grade of C is still C, etc.

Compute the letter grade by whatever technique or divination you ordinarily use. Then divide each letter grade range into 10 equal intervals, e.g., from the lowest possible B to the highest possible B. The subdivided range will be as follows:

Interval	A	B	C	D	E
10	4.5	3.5	2.5	1.5	0.5
9	4.4	3.4	2.4	1.4	0.4
8	4.3	3.3	2.3	1.3	0.3
7	4.2	3.2	2.2	1.2	0.2
6	4.1	3.1	2.1	1.1	0.1
5	4.0	3.0	2.0	1.0	0.0
4	3.9	2.9	1.9	0.9	
3	3.8	2.8	1.8	0.8	
2	3.7	2.7	1.7	0.7	
1	3.6	2.6	1.6	0.6	

If a student's grade falls within the lowest tenth of the letter range, he receives the appropriate letter grade. Then record the appropriate decimal grade from the above table. For example, B, 2.6. If it falls within the highest tenth of the range, he receives the appropriate letter grade. Then record the appropriate decimal grade from the above table. For example, B, 3.5. Etc.

Try to make the 10 intervals, within each letter approximately equal. This will present no difficulty with any numerical grading system. Letter marks given during the course can be converted to numbers for ease of computing the 10 intervals.

The use of this decimal system does not imply that your breakdown of a given letter into 10 intervals should follow any particular distribution. Possibly you will find no students falling within some of the intervals.

BE SURE TO DETERMINE LETTER GRADES FIRST AND ON EXACTLY THE SAME BASIS AS HAS BEEN USED PREVIOUSLY.

A PLAN OF ATTACK

1. Three steps

   a. Determine the letter grade in the usual manner.

   b. Subdivide the possible range of scores, marks, etc., which could fall within that letter grade into 10 equal intervals.

   c. Record both the regular letter grade and the decimal grade as determined according to the interval within which the student's record falls.

2. One example

   a. The following is one example of many possible ways to apply the decimal system. It does not necessarily represent the best or proper way to grade.

(1) Gradebook

Name	Test Grades	TOTAL
Lump	71 59 47	177
Neuron	92 98 98	298
Ogre	89 99 88	276
Techee	63 68 59	190

(2) Instructor's Letter Ranges

A	300 - 280
B	279 - 240
C	239 - 189
D	188 - 149
E	148 - 0

(3)

Total Interval	Divided in Tenths
A - 21	2.1
B - 40	4.0
C - 51	5.1
D - 40	4.0

(3) Determine Decimal Grades

LUMP Total: 177
Appropriate letter range: D 188 - 149
Interval: 4.0
LUMP is in the 8th interval from the lowest D (177-180) so she receives both D and 1.3.

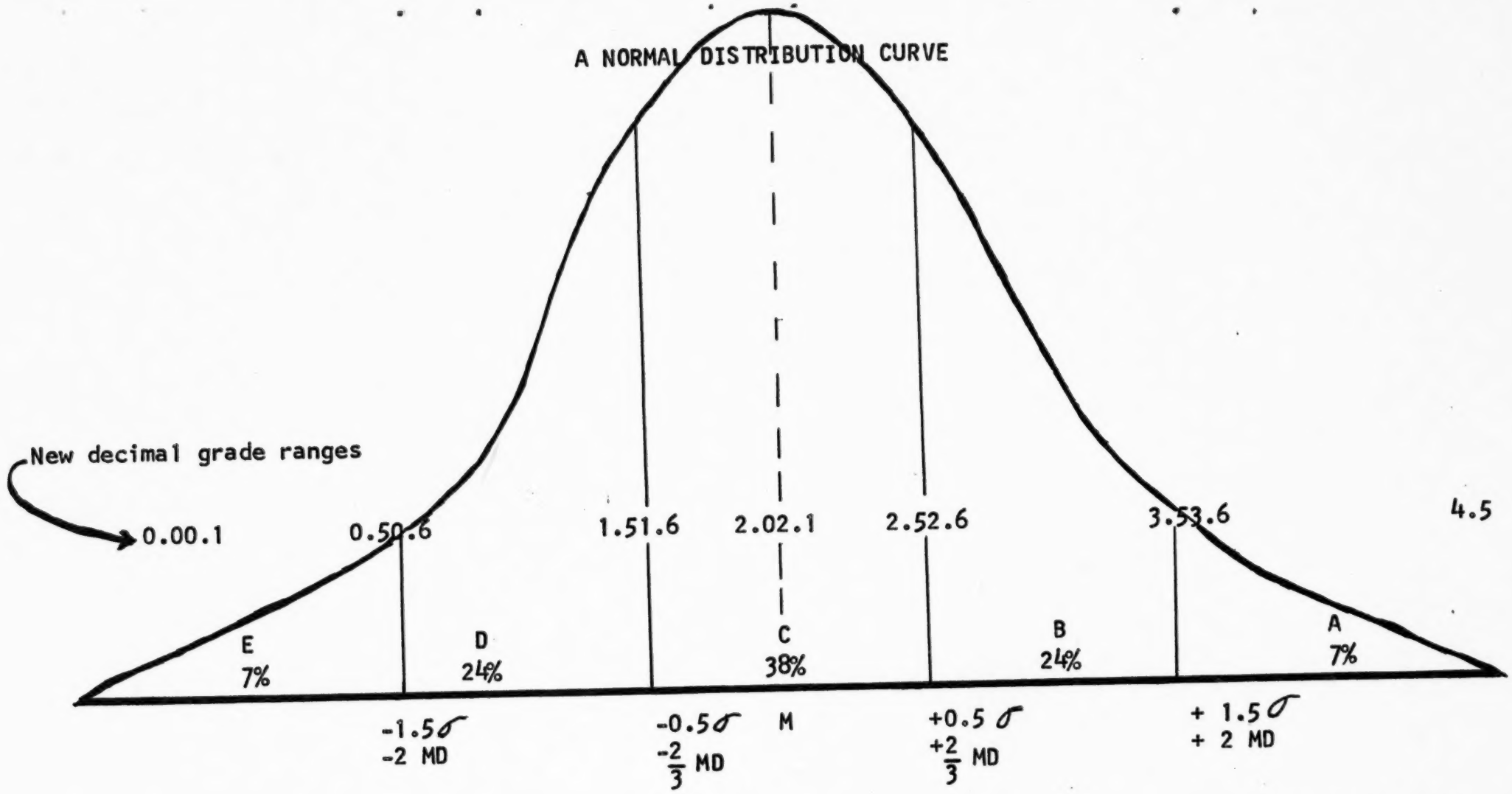
NEURON Total 298
Appropriate letter range: A 300 - 280
Interval: 2.1
NEURON is in the 10th interval from the lowest A (300-297.9) so he receives both A and 4.5.

OGRE Total: 274
Appropriate letter range: B 279 - 240
Interval: 4.0
OGRE is in the 9th interval from the lowest B (275 - 272) so he receives both B and 3.4.

TECHEE Total 190
Appropriate letter range: C 239 - 189
Interval: 5.1
TECHEE is in the first interval from the lowest C (193.1 - 189) so she receives both C and 1.6.

The plan adopted by the Faculty Senate did not provide ten intervals for the E, or failing grade. You will need to adjust the procedure to record E grades in the given interval pattern.

DETERMINE LETTER GRADE FIRST IN THE USUAL MANNER. Then, determine the decimal grade as described above.



A normal distribution curve has its greatest use in dealing with large groups. It has definite limitations in dealing with small groups. In practice, distributions are sometimes skewed toward one or the other end of the distribution. Occasionally, especially in small groups, no grades will be found in one of the five categories. Statistical procedures, such as those using standard deviations (σ), are superior to using fixed percentages. The normal distribution curve indicates that we should expect (1) far more 1.5, 1.4, 1.3 than 0.6,0.7,0.8 grades; (2) more 2.0, 2.1 than either 1.6, 1.7, or 2.4, 2.5 grades; (3) far more 2.6, 2.7 than 3.4, 3.5 grades; and (4) most of the A grades being in the 3.6, 3.7, 3.8, 3.9, 4.0, 4.1, 4.2 levels, with a rapidly decreasing number as the decimal grade progresses up the scale.

GUIDELINES FOR DEPARTMENTAL and COURSE GRADE DISTRIBUTIONS

The following guidelines have been used for several years to indicate a normal expectancy (based on past experience) for departmental or course grade distribution for various course levels (freshman - 100, sophomore - 200, junior - 300, and senior - 400). Full details concerning the 1963 autumn quarter distributions may be obtained from a communication from the Dean of Instruction under the date of February 28, 1964. A copy should be in the files of your department and/or division chairman.

Freshman level:	2.00 to 2.40 (or 2.45)
Sophomore level:	2.10 to 2.55 (or 2.60)
Junior level:	2.20 to 2.70
Senior level:	2.30 to 2.90

The average G.P.A. at Central Washington State College, and at many other colleges and universities in the Pacific Northwest, for all levels (freshman, sophomore, etc.) normally falls at about the 2.5 to 2.7 level.

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APPENDIX B

Dear Student,

During the past year, all students at C.W.S.C. were marked on two different grading systems by their instructors. One was the familiar A, B, C, D, etc. The other was an experimental fractionated scale which divided each letter grade into 10 intervals.

One of the purposes of this study was to investigate the possibility of achieving higher correlations between the students' predicted grade (Washington Pre-College Differential Prediction Program) and the reported college grades. The experimental fractionated scale was designed to accomplish this by providing the instructor with a scale with which he could more accurately report the exact accomplishment of the student. An increased correlation between the predicted grades and the achieved grades reported on the new scale could contribute greatly to the improvement of our counseling program with students, career decisions for students, and the manner in which our admissions and retention program will function.

For purposes of explanation the two scales appear as follows:

Old Scale	New Scale
	Hi A 4.5
	4.4
	4.3
	4.2
	4.1
A 4.00	4.0
	3.9
	3.8
	3.7
	Lo A 3.6
	Hi B 3.5
	3.4
	3.3
B 3.00	3.2
	3.1
	3.0
	2.9
	2.8
	2.7
	Lo B 2.6
	Hi C 2.5
	2.4
	2.3
	2.2
C 2.00	2.1
	2.0
	1.9
	1.8
	1.7
	Lo C 1.6
	Hi D 1.5
	1.4
	1.3
	1.2
D 1.00	1.1
	1.0
	.9
	.8
	.7
	Lo D .6
	.5
	.4
E 0.00	.3
	.2
	.1
	.0

Partly because of the experimental nature of the new scale, results from it were not reported to students. The grades on both scales from the 1964-65 year are being analyzed and preliminary results indicate that:

1. Thirty-four of the thirty-eight subject areas had more accurate student grade predictions.

2. The new scale provides more flexibility in the assignment of grades and therefore results in a higher correlation with overall college grade prediction.

3. Grade reports on the new scale for the autumn quarter more accurately predict the total years' performance making possible better individual schedule planning at the beginning of the school experience.

4. Almost every student had a somewhat different grade-point average as reported by the new scale. The new scale would have affected 15% of all the students who were borderline. In this category the new scale saves the students with the higher predicted grades and high school G.P.A.

CENTRAL IS NOW AT A POINT OF DECISION. Should we adopt the new fractionated scale? Your thoughtful consideration of the issue is crucial. YOUR OPINION WILL COUNT. Please consider the following typical arguments and then indicate your answer.

CON

Against adopting the fractionated grading scale.

1. It is difficult and at times almost impossible for an instructor to decide whether a student should be marked on one decimal or another, eg. 2.4 or 2.5.

2. Other institutions do not use this particular fractionated scale. There would be some mechanics to work out in order to transfer credits and grade-points.

PRO

For adopting the fractionated grading scale.

1. An instructor often has the same problem in deciding whether a student should receive a C or a B, a B or an A, etc. Mistakes, or lack of reliability in such judgements seems far less crucial between decimal points than between grade letters when determining G.P.A.

2. Compressing a detailed scale into a simpler one is a relatively easy task with modern computing systems. A translated version could be placed on all transcripts.

CON

3. Adoption would result in the emphasis on grades themselves rather than on learning and scholarly accomplishment. Students are too grade conscious already and a change in the grading system would only increase this emphasis.

4. Other institutions have tended to compress grade scales, e.g., S or U. Colleges which tried fractionated grades soon dropped them and reverted to the old system.

PRO

3. It is doubtful that any change in grading scales themselves, except for the actual elimination of grades will change the emphasis on "working for" grades. This fractionated grading scale allows the student to get exactly what he earns, e.g. a high C gets just that, unlike the present system which lumps all C's together. The new scale may stimulate sustained scholarship by giving more accurate reinforcement for performance.

4. No other institution has reported a study as detailed and as complete as the one now being accomplished at Central. Previous studies were performed prior to the development and utilization of data processing by electronic equipment, which has eliminated the awkward and manual computations.

Assuming that Central Washington State College will make a decision to adopt the new fractional scale this year or to continue with the old A, B, C, system, how do you vote?

☐ Yes, adopt the new fractionated scale.

☐ No, stay with the old scale.

COMMENTS:

Do you feel that the new scale will:

☐ Encourage you to improve your present study habits?

☐ Result in no change of study habits?

☐ Discourage your present efforts?

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SUMMARY

Title : SOME EFFECTS OF A REFINED GRADING SCALE

Investigators: Maurice L. Pettit and Jack J. Crawford

Institution : Central Washington State College, Ellensburg, Washington

Project Number: S-286

Duration : From June 1, 1965, to June 30, 1966

BACKGROUND

The need for accurate information about human behavior, in order to make accurate estimates of future behavior, is an integral part of the science of Psychology. The only way for the latter information to be more accurate is to improve the processes for gathering, reporting, and applying the former. The more discreetly these assessments and reports are accomplished, the more usable the results become. Education is,at the moment, in great need of more accurate data in order to improve the quality of its teacher-learning, counseling and advisement processes, and to report the results of such processes. The college advisement and counseling program continues to suffer because of the shortage of reliable information so essential for the operation of an effective student personnel services program. This study was an attempt to introduce some refinement into the most widely used of all data, teacher marks. The advisement and counseling of students about their educational future can only make the necessary contribution when the teacher's mark is reliable and valid.

OBJECTIVES

1. To explore the effects of reporting academic achievement on a refined scale rather than the typical A, B, C, D, and E scale.
2. To compare grade predictions using the traditional and the new scale as criteria.
3. To determine the effect of a fractional scale upon the number and identity of probationary students, students in the average or middle academic group, and honor students.

OBJECTIVES (Cont'd)

4. To assess the attitude of students toward the adoption of the fractionated scale.
5. To assess the attitude of the teaching staff toward the use of the new scale.

PROCEDURE:

The population for this study consisted of all students registered at Central Washington State College for the Fall, Winter and Spring quarters for the 1964-65 academic year. A letter grade and a fractional scale grade was reported by each instructor for each student in each course for this academic year. The number of students involved was 3700 and the faculty involved in the study numbered 220. Beginning in the Fall quarter of 1964, all instructors at Central Washington State College attended the orientation meetings wherein they received instructions on how to report their academic achievement grades on the new fractional scale. Examples of how the new scale would apply were given to the faculty by means of audio-visual aids and especially prepared instructions for them to use while accomplishing their report of first-quarter grades. This appears in the appendix of the final report. The fractional scale was a simple scale of forty-five intervals that divided the traditional A, B, C, D, and E into ten intervals each, as shown below:

OLD SCALE	NEW SCALE
	High A 4.5
	4.4
	4.3
A 4.00	4.2
	4.1
	4.0
	3.9

OLD SCALE	NEW SCALE
	3.8
A 4.00	3.7
	Low A 3.6
	High B 3.5
	3.4
	3.3
	3.2
	3.1
B 3.00	3.0
	2.9
	2.8
	2.7
	Low B 2.6
	High C 2.5
	2.4
	2.3
	2.2
	2.1
C 2.00	2.0
	1.9
	1.8
	1.7
	Low C 1.6
	High D 1.5
	1.4
	1.3
	1.2
D 1.00	1.1
	1.0
	.9
	.8
	.7
	Low D .6
	.5
	.4
	.3
E 0.00	.2
	.1
	.0

The instructors were cautioned not to modify their present way of evaluating student achievement. This was not an instructional hour in new ways of evaluating students, it was only instruction in how to report on a fractional scale the results of their presently used evaluations. After the grades for the year were accomplished on both the old scale and the new scale, the records of all the students were reviewed and those students for whom we had complete grade prediction records were finally included in the study. These numbered 2200 students. Separate IBM cards for each student in each class were then prepared. Each IBM card contained the student code number, the name of the instructor, the name of the course enrolled in, the number of course credits, the predicted grade for that course, the predicted grade for his all college average, the achieved grade for that course on the old scale, the achieved grade for that course on the new scale, and the products of the grade point and the course credits on both scales. This meant that each quarter's work required approximately 10,000 separate IBM cards to record all the data. When the decks were finally prepared, a program was written for the correlations which were accomplished between predicted grades and achieved grades for each instructor, each department, each group of students, eg., those in the honors group, those in the average or middle group, and those in the probationary status. The all-college group was also computed. It should be pointed out that the data for this study was gathered on the 1964-65 academic year students and the treatment of the data was accomplished during the 1965-66 school year. The students' reactions to the possible adoption of the fractionated scale was secured by an opinionnaire. The opinionnaire appears in the appendix of the final report. This was done by selecting the students who had participated or had grades turned in on their academic

work on both scales. These students were in seven separate departments and numbered 312. During the Spring quarter, the Faculty Senate was also presented with the results of the studies and their reactions obtained. At the same time the Faculty's reaction to the possible adoption of the new scale was obtained. All of the correlations and statistical analysis of the data was performed at the University of Washington's computer center.

RESULTS AND CONCLUSIONS

Results

1. Twenty-eight departments showed higher correlations between the predicted grade and the achieved grade when the new scale was applied. Only four departments showed a lower correlation. The Chi-square test showed this to be significant at the .01 level. The range of correlations for departments was .55 for the old scale and .59 for the new scale. A table listing all the correlations on both scales appears in the final report.

2. Of the 159 instructors, 118 had increased correlations with the new scale while thirty-four had lower correlations, and for seven instructors the correlations showed no change. Some correlations were omitted from the final count because of the unusually small number of cases. The Chi-square test showed this to be significant at the .01 level. The range of correlations was from a positive .6582 to a negative .35 for the old scale and from a positive of .7367 to a negative .1706 for the new scale. A table of the correlations by instructors for both scales appears in the final report.

3. One department had seven instructors out of sixteen who had negative correlations on both the old and new scale.

4. The new scale selected different students for honors, those to remain in good standing but not honors, and those to be placed on probation or in the academic casualty group. The students who were selected for retention by the new scale tended to be those students who had higher high school grade point averages, had higher predicted grades, and carried more course credits for the year. The old scale tended to retain students with a much lower high school GPA, predicted grade, and who carried six credit hours less per academic year. A table showing the correlation between predicted and achieved grades on both scales for the honor students by departments appears in the final report.

5. The correlations between the predicted all college average and the achieved all college average for the old scale and the new scale was .48 and .49 respectively. The overall college average when graded on the old scale was 2.44 and 2.45 on the new scale. The average grade point on the old scale and the new scale for the honor student was 3.28 and 3.30 respectively. For the average group it was 2.46 and 2.47 respectively, and for the probationary group it was 1.62 and 1.64 respectively.

6. Of the 321 students expressing an opinion as to their favor or disfavor with the new scale, 278 voted favorably and forty-three voted against its adoption, or an approximate ratio of seven to one in favor of the new scale. When the students were asked whether or not the new scale would effect their study habits, they responded in this way: 125 felt the new scale would encourage better study habits, while two thought it would not; 121 suggested there would be no change in study habits, while thirty-two who voted against adoption thought there would be no change in study habits; two students who voted for the adoption of the new scale thought it would discourage present study efforts while five who voted against the new scale thought it would discourage their study efforts; thirty who voted for

adoption of the new scale had no opinion about the study habits and four who voted against the adoption had no opinion about the effect the new scale might have on their study habits. This result shows that approximately fifty per cent of the students felt that better study habits would result if the new scale was adopted.

7. When the Faculty Senate reviewed the results of the study, they voted overwhelmingly to adopt the new scale. Their vote showed eighteen in favor, four opposed, and three abstaining.

8. When the faculty voted on the possible adoption of the new scale, 114 voted against the new scale, while seventy-seven voted for the new scale. About one-third of the faculty did not exercise their vote. Because the old and new grade scale had been used during the 1964-65 academic year and the analysis of the data did not occur until the 1965-66 academic year, a different group of faculty members, (approximately fifty) were responding to the new scale's application. It is not known how the fifty new members voted. It is unfortunate that the new members had not had any familiarity with the new scale. They had neither used it nor had they any direct association with it. This was an unfortunate circumstance that could not be controlled because of the decree by the Faculty Senate that all of the faculty members should give their reactions to the possible adoption of the new scale.

9. One further revelation was made in the discussion by the Faculty on the new scale. Some openly admitted that they did not prepare the new scale with great care because they felt that it was too time consuming. They volunteered, however, that it was much easier to prepare for the second and third quarter. This was confirmed by the fact that 277 grade cards had to be excluded because of errors in the faculty's recording procedure, with most of the errors appearing in the Autumn quarter reports.

Conclusions

1. The new scale appears to be a superior scale for reporting grades as it produces consistently higher correlations between predicted and achieved grades for all college predictions, departments, instructors, and students by groups.

2. The new scale does not appear to elevate the all college or department grade point averages.

3. The new scale appears to be more compatible with the college admission policies and selection criteria as the new scale selects students to remain in college who have higher grade point averages from high school, have a higher predicted college grade, and carry a heavier academic load.

4. The new scale is apparently much more desirable for students than the old scale as indicated by their vote of seven to one for its adoption.

5. The new scale is a better predictor than the old scale when predicting from a student's beginning quarter, the student's grade point for the complete academic year. This has value for the faculty who counsel students about their academic program.

6. The faculty were divided in their reactions to the new scale's adoption. They were not, at least at this time, favorably disposed to its adoption. The faculty appear to be much less willing to "try on" something new.

7. The key to the effective application of a refined reporting scale appears to be in the manner in which the faculty are involved. Faculty endorsement and commitment to innovation or change is essential for any effective application. The faculty appeared to be much more ego involved in this change than were the students whom they teach.

BIBLIOGRAPHY

There are fifty-nine references listed in the final report.

PUBLICATIONS

None.